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A prospective investigation of the role of cognitive factors in persistent Posttraumatic Stress Disorder (PTSD) after physical or sexual assault

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Abstract

The effectiveness of psychological treatments for PTSD is likely to be enhanced by improved understanding of the factors involved in maintaining the disorder. Ehlers and Clark [A cognitive model of persistent posttraumatic stem disorder Behav. Res. Ther. 38 (2000) 319–345] recently proposed a cognitive model of maintenance. The current study aimed to investigate several cognitive factors highlighted in Ehlers and Clark's model using a prospective design.

Fifty-seven victims of physical or sexual assault participated in the study. Cognitive factors were assessed within 4 months of assault and victims were followed-up 6 and 9 months after the assault.

Cognitive variables which significantly predicted PTSD severity at both follow-ups were: cognitive processing style during assault (mental defeat, mental confusion, detachment); appraisal of assault sequelae (appraisal of symptoms, perceived negative responses of others, permanent change); negative beliefs about self and world; and maladaptive control strategies (avoidance/safety seeking). Relationships between early appraisals, control strategies, and processing styles and subsequent PTSD severity remained significant after statistically controlling for gender and perceived assault severity. These findings support the cognitive model of PTSD proposed by Ehlers and Clark and suggest that effective treatment will need to address these cognitive factors.

Keywords: Posttraumatic stress disorder; Cognition; Prospective; Assault

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1. Introduction

Posttraumatic stress disorder (PTSD) is a common sequela of traumatic events such as physical or sexual assault. A sizeable proportion of victims recover in the ensuing months without treatment. However, a significant subgroup suffer persistent PTSD (Rothbaum, Foa, Riggs, Murdock, & Walsh, 1992; Riggs, Rothbaum, & Foa, 1995). It is largely the latter group who present for treatment. Thus, treatment of PTSD requires knowledge of the factors involved in the maintenance of PTSD as well as its initial development.

Several theorists have proposed that cognitive factors play a role in the persistence of PTSD. They have linked the severity of PTSD to specific maladaptive beliefs about the self and the world, to the nature of the traumatic memory, or to both maladaptive beliefs and the nature of the memory (Janoff-Bulman 1985, 1989; McCann & Pearlman, 1990; Epstein, 1991; Roth & Newman, 1991; Foa & Riggs, 1993; Resick & Schnicke, 1993; Brewin, Dalgleish, & Joseph, 1996; Horowitz, 1997; Joseph, Williams, & Yule, 1997; Foa & Rothbaum, 1998). A recent synthesis of cognitive factors maintaining PTSD is presented by Ehlers and Clark (2000).

Ehlers and Clark argue that victims who go on to suffer persistent PTSD process the trauma in such a way that it leads to a sense of serious current threat. One source of a sense of serious current threat is the appraisals of the trauma and its sequelae. The perceived threat may be external (i.e. 'nowhere is safe', 'I cannot rely on other people') or internal (i.e. 'I can't trust my own judgements', 'I am going mad', 'It was my fault'). Such appraisals generate strong emotions such as anxiety, anger, shame or guilt as well as arousal symptoms. They also motivate the person to engage in maladaptive strategies to control threat. These control strategies may themselves exacerbate PTSD symptoms. For example, rape victims who believe they will go mad unless they control their intrusive thoughts will make intentional efforts to suppress trauma related thoughts with the paradoxical effect of elevating their intrusions (Wegner, 1989; Davis & Clark, 1998; Shiperd & Beck, 1999). Other control strategies maintain PTSD by preventing disconfirmation of negative beliefs and appraisals and/or by preventing change in the trauma memory. For instance, victims who ensure they are not alone or who change their appearance to prevent unwelcome advances may continue to believe they would have been assaulted again if they had not taken these protective actions.

A second source of a sense of current threat is the nature of the trauma memory itself. It is argued that persistent PTSD is associated with trauma memories which are poorly elaborated and poorly integrated into existing autobiographical memories (see also Foa, Molnar, & Cashman, 1995a; van der Kolk & Fisler, 1995; Brewin et al., 1996; Conway, 1997a,b). It is proposed that poor elaboration and incorporation of trauma memories accounts for the difficulty PTSD sufferers have in intentionally recalling aspects of the trauma memory, whilst experiencing unintentional triggering of re-experiencing symptoms and intense emotions to trauma related cues. In addition the incorporation of information which might disconfirm negative appraisals is hampered when memories are poorly elaborated.

Preliminary support for this model with assault victims has come from two retrospective studies which showed that negative appraisal of the trauma/trauma sequelae, and maladaptive control strategies, were associated with persistent PTSD (Dunmore et al., 1997, 1999). However, retrospective studies are open to a range of alternative interpretations and, as yet, no prospective investigation has been reported. The current study represents an initial attempt to address this

gap. A number of the cognitive factors described in the Ehlers and Clark (2000) model were assessed shortly after an assault and the study investigated their relationship with PTSD severity several months later. Moreover, the study aimed to determine whether the cognitive factors predict PTSD severity over and above factors which have already been established as predictors of PTSD, namely objective and subjective trauma severity (Kilpatrick, Saunders, Amick-McMullan, Best, Veronen, & Resnick, 1989). The particular variables investigated in the current study are set out below.

First, we investigated cognitive processing styles during the assault that may contribute to perceived current threat and/or influence the nature of the trauma memory. The first of these cognitive processes was *mental defeat*. This refers to perceived loss of psychological autonomy, accompanied by the sense of not being human any more. The experience of mental defeat seriously challenges the person's sense of worthiness and competence, and it has been found to be associated with PTSD severity in number of studies (Ehlers, Mayou, & Bryant, 1998a; Ehlers, Clark, Dunmore, Jaycox, Meadows, & Foa, 1998b; Dunmore et al., 1999; Ehlers, Maercker, & Boos, 2000). The other aspects of cognitive processing investigated in the current study were *mental confusion* and *detachment*. Both are postulated to affect the quality of encoding and hence the nature of the trauma memory. Preliminary evidence suggests a relationship between mental confusion and PTSD (Dunmore et al., 1999) and between detachment and posttrauma psychopathology (Breslau & Davis, 1992; Koopman, Classen, & Spiegel, 1994).

Second, we investigated the negative appraisals of the traumatic event and the negative appraisals of the sequelae of the trauma which are both postulated to contribute to perceived current threat by Ehlers and Clark (2000). Appraisals of the traumatic event included *negative appraisals of emotions* during the trauma (i.e. 'If I can react like that I must be very unstable') and *negative appraisals of actions* during the trauma (i.e. 'I blame myself because my actions made things worse'). Appraisals of the trauma sequelae included *negative appraisals of initial PTSD symptoms* (i.e.'My reactions since the assault mean I am losing my mind'); *negative perceptions of other's responses* (i.e. 'I feel like other people are ashamed of me now'); *negative perception of permanent change* following the trauma (i.e. 'My life has been destroyed by the assault'); and *trauma sensitive beliefs* (i.e. appraisals about the self 'I am disgusting'; and the world 'There is no place which is safe'). Evidence supporting the role of these variables in PTSD has been gained in a number of studies (*negative appraisal of emotions*: Dunmore et al., 1999; *negative appraisal of actions*: Joseph, Brewin, Yule, & Williams 1991, 1993; Riggs, Foa, Rothbaum, & Murdock, 1991; Frazier & Schauben, 1994; *negative appraisal of PTSD symptoms*: Ehlers & Steil, 1995; Ehlers et al., 1998a; Dunmore et al., 1997, 1999; Clohessy & Ehlers, 1999; Steil & Ehlers, 2000; *negative perception of other's responses*: Davis, Brickman, & Baker, 1991; Ullman, 1996; Dunmore et al., 1997, 1999; and *perceived permanent change*: Ehlers et al., 1998b, 2000; *trauma sensitive beliefs*; Dunmore et al., 1997, 1999; Mechanic & Resick, 1993; Wenninger & Ehlers, 1998). However, no study has attempted to assess all the cognitive variables shortly after a trauma and to investigate their relationship with PTSD at later time points.

Third, we investigated *maladaptive control strategies* including avoidance behaviour (e.g. avoiding unfamiliar places or situations), cognitive avoidance (e.g. trying to distract oneself from distressing thoughts), safety seeking (e.g. carrying a weapon) and ruminative attempts to erase or 'undo' assault memories (e.g. imagining ways one could have defended oneself). Positive associations between avoidance strategies and posttrauma psychopathology have been found across

different types of trauma (Wirtz & Harrell, 1987; McFarlane, 1988; Bryant & Harvey, 1995; Sutker, Davis, Uddo, & Ditta, 1995; Charlton & Thompson, 1996; Dunmore et al., 1999) and preliminary evidence suggests an association between posttraumatic psychopathology and rumination/'undoing' (Mechanic & Resick, 1993; Ehlers et al., 1998a,b; Clohessy & Ehlers, 1999; Steil & Ehlers, 2000). With the exception of Wirtz and Harrell (1987), McFarlane (1988) and Mechanic and Resick (1993), all studies have used cross-sectional methodologies, therefore, it is timely to investigate the relationship between maladaptive control strategies and PTSD severity in a prospective design.

2. Method

2.1. Design

People who had been physically or sexually assaulted within the previous 4 months were assessed using a semi-structured interview, covering assault severity and background factors, and questionnaires assessing the cognitive factors hypothesised to be associated with the development and/or maintenance of PTSD. Subsequently, participants were followed-up by mail at monthly intervals, for nine months after the assault to determine PTSD severity.

2.2. Participants

Fifty seven participants (31 women and 26 men) who had been assaulted within the previous 4 months were included in the study. Participants were recruited by posters in public places; advertisements in local newspapers; presentations on local radio programmes and contacts with local 'Victim Support Schemes', police services, hospitals and head injury services. Participants were excluded from the study if the assault occurred in the context of ongoing domestic violence. Fifty-one participants had experienced physical assault and six participants had experienced sexual assault.

Two participants (4%) were interviewed during the first month after being assaulted, 24 (42%) were interviewed during the second month, 18 (32%) were interviewed during the third month and 13 (23%) were interviewed during the fourth month after being assaulted.

2.3. Measures

2.3.1. PTSD symptom scale: self-report version (PSS-SR: Foa, Riggs, Dancu, & Rothbaum, 1993)

This 17 item scale corresponds to the PTSD symptoms listed in DSM-IV (American Psychiatric Association, 1994). The PSS-SR has been demonstrated to have acceptable to good levels of reliability and validity (Foa et al., 1993) and provides a measure of the severity of symptoms. The PSS-SR is an earlier version of the Posttraumatic Diagnostic Scale that has satisfactory agreement with the Structured Clinical Interview for DSM-IV (Spitzer, Williams, Gibbon, & First, 1990) (kappa=0.65, agreement=82%, sensitivity=0.89, specificity=0.75; Foa, Cashman, Jaycox, & Perry, 1997). *Initial* PTSD severity was assessed using the PSS-SR specifying the month prior

to the interview. PTSD severity at *follow-up* was assessed using the PSS-SR specifying the month prior to the follow-up.

2.3.2. Beck depression inventory—(BDI; Beck, Rush, Shaw, & Emery, 1979)

The BDI was used to assess levels of depression at each time point.

2.3.3. Semi-structured interview

An interview was developed to assess participants' background characteristics and the nature and severity of the assault. First, participants were asked to provide *demographic information*. Next, they were asked about any *other traumatic events* that they had experienced either as an adult or as a child. Participants were asked if they had experienced any of twelve different traumatic events including previous assault. Three of these events related to incidents of child abuse (physical abuse, sexual abuse, and witnessing domestic violence). Participants were then asked if they had experienced any *psychological difficulties* prior to and/or following the assault. Next participants described the assault in their own words. Participants were also asked a series of specific questions about the *nature and severity of the assault*. These included questions about the number of assailants; the participant's relationship to the assailant/s; the time, location, and duration of the assault; the level of threat used by the assailant/s (presence and use of a weapon and use of physical and/or verbal force); and the extent of any injury. To assess subjective assault severity participants rated *perceived threat to life and perceived threat of serious injury* on 0–100 scales. In addition *perceived uncontrollability* over both the event and one's thoughts/feelings was rated on seven point Likert scales (ranging from 'totally agree' through 'neutral' to 'totally disagree'). The remaining questions in the interview dealt with the *legal consequences* of the assault, including whether there had been any court action.

2.3.4. Cognition and behaviour questionnaires

Eight questionnaires[1] assessed the cognitive and behavioural factors postulated to be involved in the onset and maintenance of PTSD following assault. Of primary interest was whether early cognitions (occurring during or soon after the assault) were associated with PTSD at a later time point. Therefore, the questionnaires focused on cognitions during and/or in the month after the assault, rather than on cognitions at the time of assessment. These questionnaires were developed for a previously reported study in which they were found to be able to distinguish between victims with and without PTSD (Dunmore et al., 1999) and showed satisfactory to good reliability and validity (discrimination between groups).

2.3.4.1. Cognitive processing during assault A 29-item questionnaire assessed participants' cognitive processing during assault. Each item was rated on a 5-point scale relating to the extent to which the participant had experienced each type of thought during the assault (ranging from 'did not occur at all' to 'all of the time'). The questionnaire consisted of four subscales; *mental defeat* (12 items; alpha=0.90), *mental planning* (9 items; alpha=0.65), *mental confusion* (5 items; alpha=0.60), and *detachment* (3 items; alpha=0.83). Mental defeat items assessed the extent to

[1] Questionnaires available on request.

which victims had mentally given up efforts to retain their sense of being human with a will of their own, or perceived that they had relinquished their autonomy (i.e. 'I didn't feel like I was a human being any more'; 'I mentally gave up'). In contrast, mental planning items assessed the extent to which participants had been thinking of ways to escape or influence the assailant, or thinking of ways to protect themselves physically or psychologically (i.e. 'I went through in my mind ways in which I may cope better with the assault'; 'I tried to work out what kind of person the assailant was'). Items on the mental confusion subscale related to being unable to focus on what was happening, including having your mind go blank or fixing on irrelevant things (i.e. 'I couldn't believe this was happening to me'; 'My mind went blank'). Detachment items asked participants to rate the extent to which they shut off from what was happening both in terms of their thoughts and their emotions (i.e. 'I automatically shut down and detached from what was happening').

2.3.4.2. Appraisal of reactions during assault The *negative appraisal of emotions* questionnaire consisted of seven items (alpha=0.76) designed to assess participants' appraisal of the emotions which they had experienced during the assault. Each item specified a possible interpretation of the emotions (e.g. 'If I can react like that, I must be very unstable'; 'I cannot accept the emotions which I had') and participants were asked to rate how much they would have agreed with each statement in the month after the assault. Unless otherwise stated these, and all remaining items, were rated according to the 7 point agree/disagree scale described earlier.

The *negative appraisal of actions* questionnaire consisted of six items (alpha=0.53) dealing with the extent to which participants believed that they were to blame for the assault (e.g. 'It is my fault that the assault happened because I could have prevented it and I didn't'; 'I blame myself because my actions made things worse').

2.3.4.3. Appraisal of sequelae of assault A 24-item questionnaire (alpha=0.84) assessed participants' *negative appraisals of initial posttrauma symptoms*. The questionnaire covered appraisal of post-assault reactions in general (i.e.'My reactions since the assault mean that I must be losing my mind') as well as appraisal of specific PTSD symptoms, including intrusions (i.e. 'Something terrible will happen if I do not try to control my thoughts about the assault'), avoidance (i.e.'If you avoid things after an assault it means you are a coward'), emotional numbing ('If you feel very numb after the assault it means you will never be able to be in touch with the world again'), and memory blanks (i.e.'If you cannot remember something about the assault then it is because you would find it unbearable'). It also assessed appraisals of subsequent anger (i.e. 'Anger will make you go off the rails') and guilt ('If you feel guilty it must mean that I really was to blame for what happened').

The *perception of others' responses* questionnaire consisted of 13 items (alpha=0.92) assessing negative perceptions of others' responses (i.e. 'People who I thought would stand by me have let me down'; 'I feel like other people are ashamed of me now') and seven items (alpha=0.82) assessing positive perceptions of others' responses (i.e.'Other people are genuinely concerned about me'; 'There is someone who I can completely confide in').

An 11-item *perceived permanent change* questionnaire (alpha=0.92) assessed the extent to which participants believed the assault to have had a permanent negative impact on their lives

(i.e. 'I will never recover'; 'My life has been destroyed by the assault'; 'I feel like I don't know myself any more').

2.3.4.4. Trauma sensitive beliefs We were also interested in the pretrauma beliefs which may make an individual vulnerable to threat appraisals and thus to PTSD, and in how these beliefs change following an assault. There is debate as to whether victims who are vulnerable to PTSD are more likely to experience shattering of *positive* pretrauma beliefs (Janoff-Bulman & Frieze, 1983), or confirmation of *negative* pretrauma beliefs (Foa & Riggs, 1993; Resick & Schnicke, 1993). However, to date no research has attempted to systematically assess the beliefs held by victims before a traumatic experience. Therefore, it was decided to ask participants to think back to how they would have responded to a questionnaire assessing trauma sensitive beliefs before the assault as well as after the assault.

A 59-item *trauma sensitive beliefs after assault* questionnaire (alpha=0.98) assessed beliefs potentially affected by the experience of assault. These included beliefs about being alienated or isolated from other people (i.e.'I feel isolated and set apart from others'); being unable to trust other people (i.e. 'I cannot rely on other people'); being unable to trust yourself (i.e. 'I cannot trust my own judgements'); beliefs about core aspects of the self (i.e. 'There is something wrong with me as a person'; 'I am disgusting'); the fairness and safety of the world (i.e. 'The world is dark and evil'; 'There is no justice in the world'), and beliefs about victims and emotional problems (i.e. 'People who have emotional difficulties are inferior'; 'People only get assaulted if they have done something foolish or careless').

The *trauma sensitive beliefs before assault* questionnaire (alpha=0.96) was identical to that above except that it asked participants to rate how much they would have agreed with each belief before the assault. A *change in beliefs* score was calculated by subtracting the score after assault from the score before the assault.

2.3.4.5. Maladaptive control strategies This questionnaire assessed the extent to which participants engaged in dysfunctional cognitive/behavioural strategies in the month after the assault. Participants rated how frequently they had engaged in each strategy on a four point scale ('never', 'sometimes', 'often' and 'always'). The questionnaire consisted of two subscales. The first dealt with various forms of avoidance and safety seeking (26 items, alpha=0.92) and covered avoidance of assault related situations and activities (i.e. 'Avoid people who remind you of the situation'; 'Avoid unfamiliar places or situations'), cognitive avoidance (i.e. 'Try to distract yourself from distressing thoughts'; 'Try to push thoughts of the assault to the back of your mind') and active attempts to feel safe (i.e.'Sleep with lights or radio on'; 'Sleep with or carry a weapon'). The second subscale, 'undoing' (five items, alpha=0.78), dealt with attempts to mentally erase or alter memories of the assault (i.e. 'Imagine other ways in which you could have defended yourself'; 'Try to erase memories of the assault').

2.4. Procedure

Initially participants were asked to complete the PSS-SR and the BDI with respect to their current symptoms (i.e. in the month preceding the interview). The semi-structured interview was then administered to gain background information about the participant and information about

their experience of assault. After the final section of the interview, participants were given the questionnaire assessing perception of others' reactions. Remaining questionnaires were administered in three batches, following a fixed, logical order. The first batch dealt with thoughts, emotions and actions during the assault. The second batch asked about participants' appraisal of symptoms and the use of post-assault control strategies. The final batch dealt with trauma sensitive beliefs before and after the assault. The interview and completion of questionnaires took between 1.5 and 3 h. All interviews were conducted by a female investigator (ED) and were tape recorded to check the accuracy of coding where necessary.

After the initial assessment participants were mailed the PSS-SR and the BDI once a month for nine months after the assault. If a participant failed to return the follow-up questionnaires they were reminded by telephone and/or by mail. If follow-up data at the 6 or 9 month follow-up points was missing the PSS-SR or BDI score for the directly adjacent month was used or, if both the adjacent months were available, the mean of the two adjacent months was used. If no data was available for either of these directly adjacent months then the data point was considered missing. Follow-up data was available for 49 (86%) participants 6 months after the assault and for 45 (79%) participants nine months after the assault[2].

2.5. Statistical analysis

Gender comparisons for categorical variables were conducted using the Chi^2 test, and if invalid due to small cell sizes, the Fisher's Exact test was employed (test statistic denoted by FI). For continuous variables, gender comparisons were conducted using *t*-tests. When indicated by Levene's equality of variance test, *t*-tests based on unequal variances were used. Repeated measures analyses of variance and paired *t*-tests were used to look at changes across time points. Measures of perceived life and injury threat were bimodally distributed and so were converted into dichotomous variables (perceived life threat coded as present if scoring 10 or more: perceived injury threat coded as present if scoring 50 or more).

Regression techniques were used to investigate the relationship between the cognitive variables and initial PTSD symptom severity and at 6 and 9 month follow-up. Zero order and partial correlations were calculated using the Pearson statistic. Multiple regression analyses were conducted using the 'enter' procedure in which blocks of variables are entered in a predetermined order. Path analysis, using the LISREL programme, was used to investigate inter-relationships between cognitive variables, initial PTSD and subsequent PTSD. To obtain estimates of the path coefficients at each time point, each variable was regressed on the variables that directly impinged upon it.

3. Results

3.1. Background characteristics

Background characteristics are summarised in Table 1. Nearly all participants were Caucasian and there were approximately equal numbers of men and women. Few participants had been

[2] There were no significant differences between those with follow-up data and those who failed to complete the 6 or 9 month follow-up points on assault characteristics or any demographic variable.

Table 1
Background characteristics[a]

	Total sample
Sex n(%)	
Male	26 (46)
Female	31 (54)
Ethnic background n(%)	
Caucasian	56 (98)
Non-Caucasian	1 (2)
Age (yr) mean (s.d.)	35.4 (12.8)
Marital status n(%)	
Single	23 (40)
Married/cohabiting	21 (37)
Divorced/separated	13 (23)
Education n(%)	
Degree or above	14 (25)
School exams/no exams	43 (75)
Employment status n(%)	
Full/part time work	32 (56)
Not working/studying	25 (44)
Socio-economic class n(%)	
Upper/middle	8 (14)
Middle/lower	49 (86)
Income n(%)[b]	
Less £5,000	15 (27)
£5,000–£15,000	20 (36)
Over £15,000	20 (36)
Prior trauma (other than child abuse)[c] n(%)	38 (68)
Abused as child[c]	18 (32)
Psychological difficulties pre-assault n(%)	22 (39)

[a] *N*=57 (unless otherwise specified).
[b] *N*=55.
[c] *N*=56.

educated beyond school level and most were on relatively low incomes. Over a third had experienced or witnessed physical or sexual abuse as a child. Approximately two thirds of the sample had experienced a prior traumatic event that did not involve child abuse. Men and women did not differ on any background characteristic apart from employment, where significantly fewer women than men were employed (Chi^2=5.57, *P*=0.018).

3.2. Characteristics of the assault

Assault characteristics are summarised in Table 2. The majority (90%) of assaults were physical, as opposed to sexual, in nature and over one third involved a weapon and serious injury to the victim. Assaults tended to be brief and to be perpetrated at night, by a stranger. Women were significantly more likely to have been the victim of a sexual assault (FI=0.20), whilst men were

Table 2
Assault characteristics[a]

	Total sample
Type of assault n(%)	
Physical assault	51 (90)
Sexual assault	6 (11)
Time since assault (months) mean (s.d.)	2.0 (0.8)
Relationship to assailant n(%)	
Stranger	34 (60)
Knew to some extent	23 (40)
Degree assailant was trusted n(%)	
Did not trust/neutral	48 (84)
Trusted to some extent	9 (16)
Location of assault n(%)	
Own home	11 (19)
Public place	16 (28)
Empty street/secluded alley	13 (23)
Any other location	17 (30)
Time when assault occurred n(%)	
Day (7.01 to 17.00)	14 (25)
Night (17.01 to 7.00)	43 (75)
Court action n(%)	25 (44)
Severity of assault n(%)	
Punched/kicked/choked	47 (83)
Threatened with weapon	21 (37)
Weapon used	13 (23)
Verbally threatened/abused[b]	24 (43)
Number of assailants n(%)	
One assailant	43 (75)
Two or more assailants	14 (25)
Assault duration n(%)	
Less than five minutes	40 (70)
More five minutes	17 (30)
Extent of injury n(%)	
No injury/minor injury	39 (68)
Major injury	18 (32)
Perceived a threat to life n(%)	25 (44)
Perceived a threat of injury n(%)	26 (46)
Perceived lack of control mean (s.d.)	3.7 (1.9)

[a] N=57 (unless otherwise specified).
[b] N=56.

more likely to have been assaulted at night (Chi^2=4.36, P=0.036), with a weapon (Chi^2=5.94, P=0.015). Men and women did not differ in any other respect.

3.3. Severity of PTSD symptoms at each time point

The mean PSS scores at each time point are presented in Table 3. Repeated measures analysis of variance were conducted with time (initial vs 6 months vs 9 months) as the within group factor

Table 3
Severity of PTSD and severity of depression at each time point[a]

	Total sample	Men	Women	Statistic	*P*-value
PSS-SR score (mean s.d.)					
Initial assessment	21.1 (12.1)	15.7 (10.0)	25.9 (11.9)	Time: $F(2,82)=26.65$	0.000
6 month follow-up[b]	14.9 (13.1)	8.5 (9.7)	18.5 (13.5)	Gender: $F(1,41)=8.41$	0.006
9 month follow-up[c]	11.6 (10.5)	7.0 (7.5)	14.6 (11.2)	Timexgender: $F(2,82)=1.1$	0.317
BDI score mean (s.d.)					
Initial assessment	13.3 (12.2)	7.8 (5.9)	17.8 (14.2)	Time: $F(2,80)=3.80$	0.027
6 month follow-up[b]	11.5 (11.2)	6.8 (7.2)	14.2 (12.2)	Gender: $F(1,40)=7.28$	0.010
9 month follow-up[d]	10.9 (11.4)	6.1 (7.9)	14.2 (12.4)	Time×gender: $F(2,80)=3.04$	0.054

[a] N=57; men, N=26; women, N=31 (unless otherwise specified).
[b] Total sample, N=49; men, N=18; women, N=31.
[c] Total sample, N=45; men, N=18; women, N=27.
[d] Total sample, N=44; men, N=18; women, N=26.

and gender (male vs female) as the between group factor. There was a main effect for time with PSS scores declining significantly. Post-hoc paired *t*-tests between successive time points showed a significant decline between initial assessment and 6 month follow-up ($t(48)=5.65$, $P<0.001$) and between 6 and 9 month follow-ups ($t(42)=3.02$, $P=0.004$). There was also a significant main effect for gender, but no significant interaction between gender and time suggesting that men and women recovered at similar rates. Women scored higher than men at all time points.

3.4. Depression

Mean BDI scores are also presented in Table 3. Repeated measures ANOVA revealed a main effect for time, with BDI scores declining significantly. Post-hoc paired *t*-tests showed a significant decline between initial assessment and 6 month follow-up ($t(48)=3.09$, $P=0.003$), but not between 6 and 9 months ($t(41)=0.56$, $P=0.576$). There was a significant main effect for gender with women scoring higher than men at all time points, but no significant interaction between gender and time.

3.5. Relationship between background and assault characteristics and PTSD severity (at initial assessment, 6 month follow-up and 9 month follow-up)

Correlations between background and assault characteristics and PTSD severity at each of the three time points[3] are presented in Table 4. No background characteristic was correlated with

[3] It was our intention to control for any background or assault characteristics significantly associated with PTSD when analysing the relationships between the cognitive variables and PTSD. Therefore, to be conservative, correlations between background and assault characteristics and PTSD were not corrected for Type 1 error.

Table 4
Zero order correlations between background/assault characteristics, cognitive variables, and severity of PTSD at initial assessment, 6 and 9 month follow-ups[a,b]

Variable	Entry	6 months	9 months
Background characteristics			
Sex	0.42**	0.37**	0.36*
Age	0.10	−0.14	−0.16
Marital status	0.12	0.04	0.01
Education	0.07	0.02	−0.00
Employment status	0.15	0.20	0.15
Socio-economic class	0.11	0.12	0.01
Income[c]	−0.07	0.03	0.03
Prior trauma (other than child abuse)	0.25	0.11	0.14
Abuse as a child[d]	0.15	0.31*	0.20
Psychological difficulties pre-assault	0.15	0.18	0.34*
Characteristics of assault			
Type of assault	0.27**	0.18	0.16
Time since assault	−0.08	0.01	0.09
Relationship to assailant	0.15	−0.00	0.17
Degree assailant trusted	−0.05	0.00	0.04
Location of assault	−0.10	0.09	0.09
Time when assault occurred	−0.08	0.01	0.09
Court action	0.07	0.02	0.10
Severity of assault			
Punched/kicked/choked	−0.01	0.08	0.16
Threatened with a weapon	−0.04	−0.03	−0.05
Weapon used	0.00	−0.02	−0.01
Verbally threatened/abused[d]	−0.05	0.14	0.10
Number of assailants	0.05	0.22	0.31*
Assault duration	0.14	0.25	0.23
Extent of injury	0.24	0.14	0.19
Perceived threat to life	0.33*	0.46**	0.45**
Perceived threat of injury	0.47***	0.45**	0.36*
Perceived lack of control	0.37**	0.18	0.07
Cognitive variables			
Cognitive processing during assault			
Mental defeat	0.70***	0.64***	0.64***
Mental planning	0.11	0.15	0.15
Mental confusion	0.51***	0.45**	0.54***
Detachment	0.50***	0.48***	0.45**
Appraisal of reactions during assault			
Appraisals of emotions	0.22	0.37**	0.26
Appraisal of actions	0.13	0.04	0.16
Appraisal of sequelae of assault			
Appraisals of initial posttrauma symptoms	0.26*	0.42**	0.43**
Negative perception of other's responses	0.57***	0.57***	0.57***
Positive perception of other's responses[e]	−0.25	−0.33*	−0.18
Perceived permanent change	0.62***	0.66***	0.53***
Trauma sensitive beliefs			
Negative beliefs after assault	0.42**	0.46**	0.42**
Negative beliefs before assault	0.11	0.27	0.41**
Change in beliefs	−0.51***	−0.39**	−0.22
Maladaptive control strategies			
Avoidance/safety seeking	0.78***	0.80***	0.75***
Undoing	0.46***	0.36*	0.25

[a] *$P<0.05$; **$P<0.01$; ***$P<0.001$.
[b] Initial assessment, $N=57$; 6 months, $N=49$, 9 months $N=45$ (unless otherwise specified).
[c] Entry, $N=55$; 6 months, $N=47$, 9 months $N=43$.
[d] Entry, $N=56$; 6 months, $N=48$, 9 months $N=44$.
[e] Entry, $N=52$; 6 months, $N=45$, 9 months $N=41$.

PTSD severity apart from gender that was significantly correlated with initial and subsequent PTSD severity. The experience of child abuse was correlated with PTSD severity at 6 months and pre-assault psychological difficulties were correlated with PTSD severity at 9 month follow-up.

None of the assault characteristics or measures of objective assault severity were correlated with PTSD, apart from the type of assault (with initial PTSD severity) and the number of assailants (with PTSD severity at 9 months). In contrast, perceived life threat and injury threat were significantly correlated with PTSD severity at all three time points. Perceived lack of control correlated with initial PTSD severity, but not thereafter.

3.6. Relationship between the cognitive variables and PTSD severity (at initial assessment, 6 month follow-up and 9 month follow-up)

Correlations between the cognitive variables and PTSD severity at each time point are also presented in Table 4. Eight out of the 15 cognitive variables were significantly associated with PTSD severity at all three time points (initial assessment, 6 month follow-up, 9 month follow-up). These were: mental defeat, mental confusion, detachment, negative appraisal of initial symptoms, negative appraisal of other's responses, perceived permanent change, avoidance/safety seeking, and negative beliefs after assault. Five of the remaining cognitive variables (negative appraisal of emotions during assault, positive perception of other's responses, undoing, negative beliefs before assault and change in beliefs) correlated with PTSD severity at some, but not all time points. Only two variables (mental planning and negative appraisal of actions) failed to correlate with PTSD severity at any point.

Multiple regression analyses investigated whether the significant relationships between the cognitive variables and PTSD severity remained when gender, previous history of abuse/psychological difficulties and the severity of the assault were statistically controlled. For each time point gender and the previous history/severity variables that correlated with PTSD severity at that time point[4] were (simultaneously) forced into the equation before the cognitive variables. In each case, an F-test determined whether the addition of the cognitive variable caused a significant increase in R^2 over and above that obtained with entry of the previous history/assault severity variables only. Because of missing data for some variables, these analyses were run separately for each cognitive variable to maximise the number of participants. Table 5 summarises the results of these regression analyses. Six cognitive variables produced a significant increase in R^2 over and above the previous history/severity variables at all three time points. These were: mental defeat, detachment, negative appraisal of initial symptoms, negative appraisal of other's responses, perceived permanent change, and avoidance/safety seeking. Six of the remaining cognitive variables (mental confusion, negative appraisal of emotions during assault, positive perception of other's responses, negative beliefs after assault, negative beliefs before assault, and change in negative beliefs) produced a significant increase in R^2 at some, but not all, time points.

[4] The variables controlled at all three time points were gender, perceived life threat, and perceived injury threat. Additional variables forced into the equation were: *Entry*; type of assault, perceived lack of control; *6 months*; abuse as child; *9 months*; psychological difficulties prior to assault, number of assailants.

Table 5
Summary of cognitive variables which explained variance in PTSD controlling for gender and previous history/severity variables

Cognitive variable	Change in R^2 with addition of cognitive variable											
	Initial assessment				6 months				9 months			
	R^2 chg	*F*-ratio	df	*P*-value	R^2 chg	*F*-ratio	df	*P*-value	R^2 chg	*F*-ratio	df	*P*-value
Cognitive processing during assault												
Mental defeat	0.15	16.68	1,56	0.000	0.13	12.14	1,47	0.001	0.11	9.17	1,44	0.004
Mental planning	0.01	0.47	1,56	0.497	0.01	0.57	1,47	0.454	0.03	2.10	1,44	0.156
Mental confusion	0.04	3.64	1,56	0.062	0.02	1.59	1,47	0.214	0.10	8.16	1,44	0.007
Detachment	0.08	8.19	1,56	0.006	0.09	7.52	1,47	0.009	0.11	9.23	1,44	0.004
Appraisal of reactions during assault												
Appraisals of emotions	0.01	0.54	1,56	0.464	0.08	6.98	1,47	0.012	0.01	0.39	1,44	0.535
Appraisals of actions	0.00	0.06	1,56	0.807	0.00	0.00	1,47	0.967	0.00	0.22	1,44	0.645
Appraisal of sequelae of assault												
Appraisals of initial post-trauma symptoms	0.06	6.00	1,56	0.018	0.13	11.10	1,47	0.002	0.06	4.69	1,44	0.037
Negative perception of other's responses	0.14	16.22	1,56	0.000	0.13	11.46	1,47	0.002	0.10	8.43	1,44	0.006
Positive perception of other's responses	0.11	10.82	1,51	0.002	0.10	7.15	1,43	0.011	0.03	1.74	1,40	0.200
Perceived permanent change	0.13	14.44	1,56	0.000	0.20	21.37	1,47	0.000	0.07	5.60	1,44	0.023
Trauma sensitive beliefs												
Negative beliefs after assault	0.06	5.45	1,56	0.024	0.07	5.75	1,47	0.021	0.01	1.01	1,44	0.322
Negative beliefs before assault	0.02	1.71	1,56	0.197	0.04	3.41	1,47	0.072	0.08	6.26	1,44	0.017
Change in beliefs	0.05	4.15	1,56	0.047	0.04	2.93	1,47	0.094	0.01	0.84	1,44	0.364
Maladaptive control strategies												
Avoidance/safety seeking[a]	0.25	36.61	1,56	0.000	0.26	33.08	1,47	0.000	0.15	14.59	1,44	0.000
Undoing	0.02	2.00	1,56	0.164	0.02	1.36	1,47	0.250	0.00	0.05	1,44	0.817

[a] Avoidance/safety seeking caused a significant increase in R^2 even when avoidance symptoms excluded from PSS score.

3.7. Relationship between cognitive variables and PTSD severity at 6 and 9 month follow-up after controlling for PTSD severity at initial assessment

The majority of cognitive variables correlated significantly both with initial PTSD severity and with subsequent PTSD severity. This raises the possibility that the relationship between the cognitive variables and subsequent PTSD was mediated by initial PTSD severity. That is to say, the cognitive variables may not predict subsequent severity independently of initial severity. Two types of analysis were used to address this question. First, partial correlations were computed between the cognitive variables and subsequent PTSD controlling for initial PTSD. If the relationship remains significant we can be confident that an independent relationship between the cognitive variable and subsequent PTSD exists. The results of these analyses are presented in Table 6. Negative appraisal of initial posttrauma symptoms, avoidance/safety seeking and negative beliefs before assault continued to be significantly correlated with PTSD severity at both 6 and 9 month follow-ups. In addition, negative appraisal of emotions during assault and perceived permanent change had significant partial correlations with 6 month PTSD, while mental defeat and mental confusion were significantly associated with 9 month PTSD.

Second, path analyses were conducted for cognitive variables that ceased to be significant following partialling. The logic of this second type of analysis is to determine whether it is possible that the cognitive variables could have direct and separate effects on PTSD at both

Table 6
Partial correlations between PTSD severity at 6 and 9 month follow-up and cognitive variables, controlling for initial PTSD severity[a]

Variable	6 months	9 months
Cognitive processing during assault		
Mental defeat	0.28	0.30*
Mental planning	0.06	0.09
Mental confusion	0.17	0.33*
Detachment	0.21	0.19
Appraisal of reactions during assault		
Appraisals of emotions	0.30*	0.14
Appraisal of actions	−0.08	0.04
Appraisal of sequelae of assault		
Appraisals of initial post-trauma symptoms	0.36*	0.31*
Negative perception of other's responses	0.25	0.29
Positive perception of other's responses	−0.20	−0.09
Perceived permanent change	0.38**	0.25
Trauma sensitive beliefs		
Negative beliefs after assault	0.27	0.23
Negative beliefs before assault	0.32*	0.46**
Change in beliefs	−0.06	0.15
Maladaptive control strategies		
Avoidance/safety seeking	0.54***	0.48**
Undoing	−0.00	−0.18

[a] *$P<0.05$; **$P<0.01$; ***$P<0.001$.

initial assessment and follow-up. Evidence for this hypothesis would be provided by separate and significant paths. Of the variables which were tested in relationship with 6 month PTSD (mental defeat, confusion, detachment, negative appraisal of others, positive appraisal of others, undoing, negative trauma sensitive beliefs after assault and change in beliefs) there was evidence to support a direct relationship between mental defeat and 6 month PTSD (β=0.25, $P<0.05$). This relationship is illustrated in Fig. 1. Of the variables which were tested in relationship with 9 months PTSD severity (detachment, negative appraisal of others, perceived permanent change, and negative trauma sensitive beliefs after assault) there was evidence to support a direct relationship between negative appraisal of other's responses and 9 month PTSD (β=0.27, $P<0.05$). This relationship is also illustrated in Fig. 1.

4. Discussion

In line with studies showing a decline in the prevalence of PTSD amongst assault victims over time (e.g. Riggs et al., 1995), the severity of PTSD fell significantly over the course of the study. The current study also replicated previous findings on the role of a range of variables in the natural course of PTSD including: gender (Resick, 1987; Lurigio & Davis, 1989; Riggs et al., 1995); previous trauma (Burgess & Holstrom, 1978; Astin, Ogland-Hand, Coleman, & Foy, 1995);

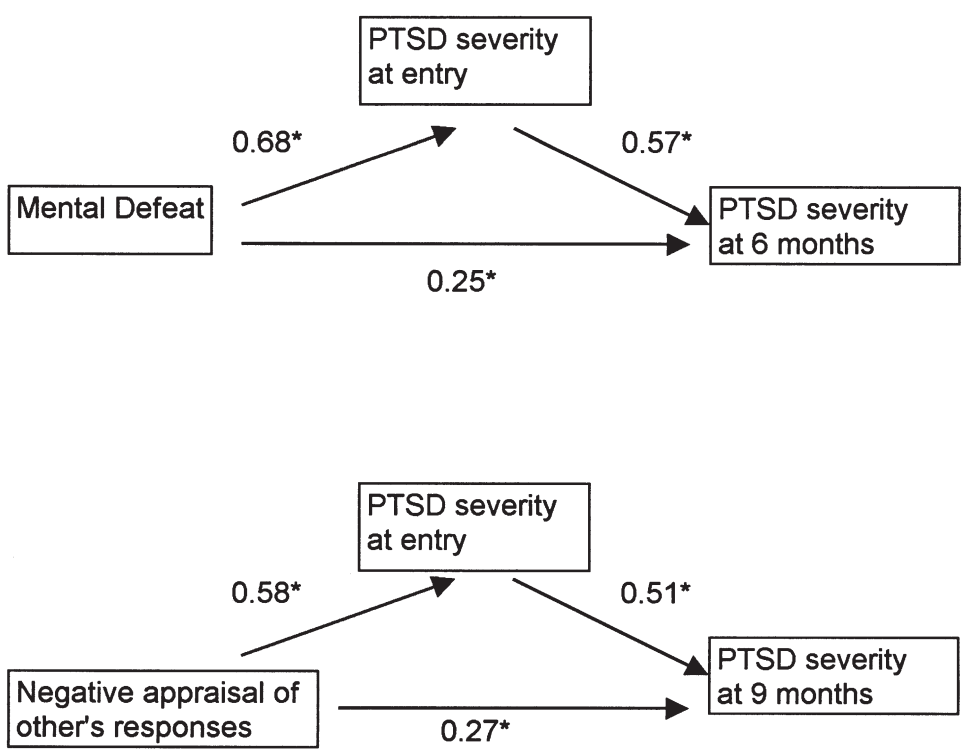

Fig. 1. Results of path analyses supporting a direct relationship between mental defeat and 6 month PTSD and negative appraisal of other's responses and 9 month PTSD respectively.

previous psychiatric history (Burgess & Holstrom, 1978; Frank, Turner, Stewart, Jacob, & West, 1981; Atkeson, Calhoun, Resick, & Ellis, 1982); subjective trauma severity (Kilpatrick et al., 1989; Riggs et al., 1991); and perceived uncontrollability (Baum, Cohen, & Hall, 1993). Evidence that the subjective severity of trauma was more important than the objective severity also accorded with earlier studies (Kilpatrick et al., 1989; Riggs et al., 1991).

Our central aim was to investigate whether variability in the persistence of PTSD was predicted by initial differences in appraisals of the trauma and its sequelae. A prospective design was employed to overcome interpretative difficulties inherent in prior retrospective studies (Dunmore et al., 1997, 1999). Cognitive variables which were significantly related to PTSD severity at both 6 and 9 month follow-ups included: processing during the trauma (mental defeat; mental confusion, detachment); appraisal of trauma sequelae (negative appraisal of initial posttrauma symptoms, negative perception of other's responses, and perceived permanent change); maladaptive control strategies (avoidance/safety seeking); and negative trauma sensitive beliefs after assault. Other variables were associated with PTSD severity at only one follow-up point (negative appraisal of emotions, positive perception of other's responses, undoing, negative trauma sensitive beliefs before assault, and change in beliefs). In the majority of instances the relationship between these early cognitive factors and subsequent PTSD severity remained significant even after controlling for gender and perceived life/injury threat. However, as in previous investigations (Rothbaum et al., 1992; Riggs et al., 1995) subsequent PTSD severity was significantly correlated with initial PTSD severity. This raised the possibility that relationships between the cognitive factors and subsequent PTSD severity were simply mediated by initial PTSD severity. This interpretation was ruled out for many of the cognitive factors by the findings of partial correlation and path analyses.

The above findings lead us to consider how the cognitive factors investigated in this study may contribute to persistent PTSD as well as to consider the implications for treatment (for a full discussion of treatment implications see Ehlers & Clark, 2000). As noted in the introduction, Ehlers and Clark (2000) argue that a key theme running through the appraisals associated with PTSD is one of *current threat*. The concept of current threat helps explain why PTSD symptoms are strongly associated with anxiety despite the event being one that is in the past.

The generation of a sense of current threat will first be considered in relation to appraisals of reactions during the assault. One reaction that may be a source of threatening appraisals is the cognitive processing style referred to as *mental defeat*. This has now been consistently found to be associated with persistent PTSD following assault (Dunmore et al., 1997, 1999; Ehlers et al., 1998b, 2000). In contrast, whilst perceived uncontrollability related to initial PTSD it did not predict the persistence of PTSD. Individuals who feel mentally defeated during a traumatic event lose their sense of psychological autonomy and cease to feel like a human being. The experience of mental defeat may be taken as evidence for a negative view of oneself (e.g. 'I am weak', 'I am worthless', 'I can't cope with stress', 'I will be assaulted again because assailants will know that I will give in'), contributing to intrusions and rumination, and avoidance of thinking and talking about the memories. Individuals who interpret their *emotional responses during trauma* as signs of being 'unstable', 'out of control', or a 'sick person' will also try to avoid confronting the memory, and experience the distress and arousal accompanying intrusive memories as threatening. Both mental defeat and negative interpretation of emotional responses during trauma may interfere with the therapeutic effects of imaginal reliving, as reliving these experiences may confirm rather than disconfirm the negative appraisals. Thus, such appraisals may need to be addressed directly in treatment (see also Ehlers et al., 1998b).

The study confirmed the role of negative appraisals of trauma sequelae in maintaining PTSD. The role of *negative appraisals of initial symptoms* in the maintenance of PTSD has been a particularly robust finding with victims of assault (e.g. Dunmore et al., 1997, 1999) and with victims of other traumas (Ehlers & Steil, 1995; Ehlers et al., 1998a; Clohessy & Ehlers, 1999; Steil & Ehlers, 2000). The daily experience of posttrauma symptoms will be highly threatening for those victims who appraise these symptoms signs of incompetence or mental instability, and will make it likely that they will use maladaptive strategies to control these symptoms that maintain PTSD. *Negative perceptions of other people's reactions* can directly lead to some PTSD symptoms, e.g., increased arousal and hypervigilance will result from the perception that others cannot be trusted, and detachment and feelings of isolation will result if it is perceived that others cannot understand or cope with what has happened. Similarly, it is possible to see straightforward links between beliefs about being *permanently damaged* (e.g. 'My life has been destroyed'; 'I'll never recover') and the symptoms of diminished interest, a sense of foreshortened future, and impaired ability to accept the trauma. The predictive power of these appraisals of trauma sequelae underscores the necessity to assess events in the aftermath of the trauma and to establish the meaning of these events to the victim in treatment. It is likely that patients will only be able to put the trauma in the past if their negative appraisals of the trauma sequelae are changed as well as their interpretation of the event itself.

It is natural that people who make the type of negative appraisals identified in this study as predictive of persistent PTSD will try to avert or control the perceived threat. Yet, such *control strategies* may bring on the very consequences they are aiming to avert. For example, a victim who perceives that other people are untrustworthy may put herself on guard to try and detect signs of hostility. This may make her appear cold and unfriendly resulting in the hostile responses that she fears. Efforts to control some PTSD symptoms may actually increase these or other symptoms. For example, trying to control nightmares by going to bed late may increase symptoms of poor concentration and irritability. Maladaptive control strategies may also maintain perceived threat by preventing disconfirmation of negative appraisals. For example, a victim who views anger as meaning that he will hurt someone may try to block out angry feelings and withdraw from social contact decreasing the likelihood of him discovering that it is possible to feel angry without becoming aggressive. In addition, avoiding thinking or talking about the trauma prevents emotional processing and elaboration of the trauma memory (Janoff-Bulman 1985, 1989; Horowitz, 1986; Foa, Steketee, & Rothbaum, 1989; Foa & Riggs, 1993; Ehlers & Clark, 2000). Successful therapy will involve detailed assessment of the, often subtle, avoidance and safety behaviour which maintain PTSD symptoms, negative appraisals, and the fragmented nature of the trauma memory.

The current study also asked whether *preassault beliefs* were related to vulnerability to PTSD. There was evidence to suggest that victims who held more negative beliefs before the assault developed more long lasting PTSD afterwards. This finding is in line with Foa & Riggs (1993) and Resick & Schnicke (1993) who propose that PTSD is often associated with the confirmation of preexisting negative beliefs. Furthermore, events after an assault, including ongoing symptoms, may provide further confirmation of preassault beliefs. This later confirmation may account for the finding that the impact of preassault beliefs increased during the months following the assault. There was some evidence to support the role of 'shattering' in PTSD (Janoff-Bulman 1985, 1989; Horowitz, 1986) from the finding that PTSD onset was associated with the degree to which

beliefs became more negative following the assault. Of course, preassault beliefs were assessed retrospectively and it could be argued that the way in which victims reacted following the assault caused them to reconstruct their preassault beliefs. However, such 'reconstruction' may still contribute to the maintenance of PTSD.

Last, looking at the nature of the trauma memory itself, several authors have argued that memories which are disorganised and fragmented will be more difficult to process and integrate into existing memories (Foa, Molnar, & Cashman, 1995a; van der Kolk & Fisler, 1995). One factor which may impact on the extent to which trauma memories are fragmented is the depth at which information is encoded during the trauma (Ehlers & Clark, 2000). People who experience *mental confusion* during an assault may be more likely to have encoded the memory at a shallower level. Another factor that may disrupt the way the event is laid down in memory is *detachment*. Detachment, emotional shutting down and numbing have been likened to freezing responses in animals (Foa, Riggs, & Gershuny, 1995b). It is possible that these responses hamper the mental absorption of the trauma contributing to PTSD. Also, people who detach during a trauma may be more likely to continue to try to detach themselves from trauma related thoughts and feelings, disrupting subsequent emotional processing and resulting in more persistent PTSD. It appears that successful treatment of PTSD requires the elaboration of the trauma memory.

4.1. Limitations

This is the first prospective study of the role of cognitive factors in PTSD specified by Ehlers and Clark (2000) after assault and certain methodological limitations mean that conclusions must remain tentative pending replication in future prospective investigations. The most serious limitation is that the relatively small sample size meant that alpha corrections to guard against Type I error could not be carried out. Consequently the number of analyses conducted may have resulted in some chance associations between PTSD and some of the cognitive variables. The validity of the current results is supported by the fact that the findings of our earlier retrospective study were replicated (Dunmore et al., 1999), however, cross validation in other prospective studies is necessary. Second, the study relied on a self report measure (PSS-SR) to assess PTSD rather than using an interview based assessment. It should be noted that the current study found similar rates of PTSD to earlier studies (Riggs et al., 1995) and that Foa et al. (1993) found the PSS-SR to have good overlap with the SCID (Spitzer et al., 1990). However, it is still conceivable that reliance on self report to assess both PTSD and the cognitive variables may have inflated correlations between the two. Third, although the study investigated the relationship between cognitive variables assessed in the first few months after assault and PTSD severity 6 and 9 months later, cognitions relating to events before, during and immediately after the assault had to be assessed retrospectively. We cannot, therefore, rule out the possibility that current PTSD status influenced participants' ratings of their early cognitions. However, for several of these variables *separate* paths were found between the cognitive variable and initial PTSD and between the cognitive variable and subsequent PTSD suggesting that distortions in memory cannot be the only explanation. Fourth, it must be noted that the study did not attempt to comprehensively assess the cognitive factors implicated in other models. For instance, the current study did not specifically assess appraisals which may underlie anger or shame, two emotions which are thought to play an important role in posttrauma psychopathology (Riggs, Dancu, Gershuny, Greenberg, & Foa,

1992; Andrews, 1995). Finally, the study was only included victims of assault and further research is needed to determine the extent to which these findings may generalise to victims of other types of trauma.

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